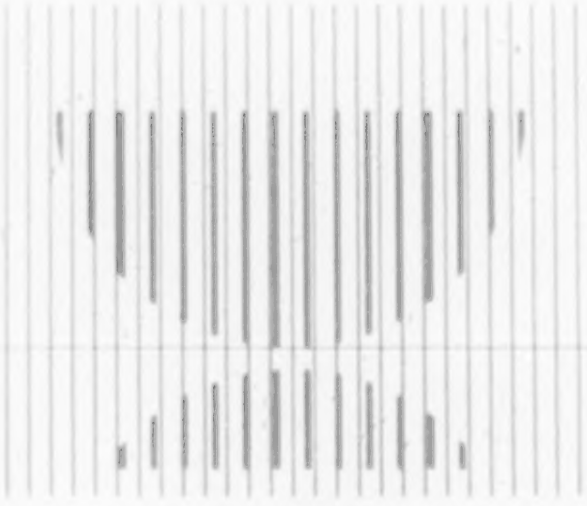
CBO STAFF MEMORANDUM

THE COSTS OF THE ADMINISTRATION'S PLAN FOR THE NAVY THROUGH THE YEAR 2010

December 1991



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This memorandum on budget requirements for the Navy was prepared by the Congressional Budget Office (CBO) in response to a request from the Chairman of the Committee on Armed Services of the House of Representatives. CBO prepared companion memorandums on budget requirements for the Army and Air Force, and an overview paper that discusses requirements for the entire Department of Defense.

Michael B. Berger of CBO's National Security Division wrote this memorandum under the general supervision of Robert F. Hale and R. William Thomas. Michael A. Miller, Raymond J. Hall, and William P. Myers of CBO's Budget Analysis Division provided detailed cost estimates. The author gratefully acknowledges the contributions of Lane Pierrot, Steven V. Glazerman, and Deborah Clay-Mendez of CBO, and Christopher P. Briem and Robert Ahearne, formerly of CBO. Sherwood Kohn edited the manuscript. Judith Cromwell prepared it for publication.

INTRODUCTION AND SUMMARY

For many decades, the U.S. Navy's force structure has been premised on countering the Soviet Union's threats to U.S. security. To counter these threats, the Reagan Administration advocated a Navy that included 15 deployable aircraft carrier battle groups, between 20 and 40 ballistic missile submarines, 100 nuclear-powered attack submarines, and enough supporting vessels to make up a 600-ship force. Officials argued that the 600-ship Navy was necessary to carry out a forward maritime strategy. According to this strategy, in a war between members of the North Atlantic Treaty Organization (NATO) and the Warsaw Pact, the Navy would attack the Soviet fleet in its home waters and, if necessary, carry the attack to Soviet territory.

Changes in the Soviet Union and Eastern Europe have made obsolete many of the assumptions that have guided naval force planners. Soviet military forces no longer appear capable of launching a sudden attack on Western Europe. A coup by hard-line factions in the Soviet Union failed, and the country is preoccupied with numerous internal problems, including economic stagnation, deep ethnic and political divisions, and demands from its constituent republics for greater independence. The Warsaw Pact has been disbanded. West Germany and East Germany have united to form a democratic Germany that is a member of NATO.

In view of these political changes, the Administration plans to reduce the Navy from today's level of 526 ships to about 448 ships in 1997 (see Table 1). The Administration has not formally announced its plans for the number of ships and aircraft that are to be in the Navy beyond 1997, but the Navy has made statements about its long-term goals. Consistent with those statements, this memorandum assumes that the fleet of the next century will contain 12 aircraft carriers equipped with such advanced aircraft as the AX plane and the E/F version of the F/A-18. The fleet will also include 18 strategic ballistic missile submarines, 80 attack submarines, 150 surface combatants, and enough amphibious ships to transport two and one-half Marine Expeditionary Brigades (about 34,000 troops and their equipment). Because the Administration does not plan to replace on a one-for-one basis all ships that will retire, the Congressional Budget Office (CBO) projects that, under the Administration's plan, the Navy's fleet would gradually shrink to about 415 ships by the year 2010.

CBO estimated the budgetary implications of the Administration's plans and goals for the Department of the Navy, which includes the Marine

TABLE 1. SHIPS IN THE NAVY UNDER THE ADMINISTRATION'S PLAN

Type of Ship	1991[a]	1997[b]	2010[b]
Aircraft Carrier[c]	15	12	12
Attack Submarine	87	74	80
Surface Combatant[d]	188	158	150
Ballistic Missile Submarine	34	18	18
Amphibious Warfare	65	54	38
Other	137	132	117
Total	526	448	415

SOURCE: Congressional Budget Office based on Department of Defense data.

NOTE: This memorandum includes only battle force ships, as defined by the Navy. Some reserve ships and support ships are not included.

a. Estimate for September 30, 1991.
b. CBO estimate of the Administration's goal based on current policies and force goals.
c. Includes carriers undergoing a service life extension program or nuclear refueling and complex overhaul, but excludes the carrier used to train new pilots.
d. Includes battleships, cruisers, destroyers, and frigates.

Corps, through the year 2010. Through 1997, the figures are taken from the Administration's budget submitted in February 1991, including the adjustments submitted in April 1991, and its Future Years Defense Program (FYDP). Beyond 1997, the memorandum presents estimates based on assumptions about the Administration's plan. The Navy's budget would decline through 1997 under the Administration's plan. By 1997, the total Navy budget would be about $81 billion compared with $109 billion in 1990, a decline of 25 percent. (All costs in this memorandum are expressed in 1992 dollars of budget authority.)

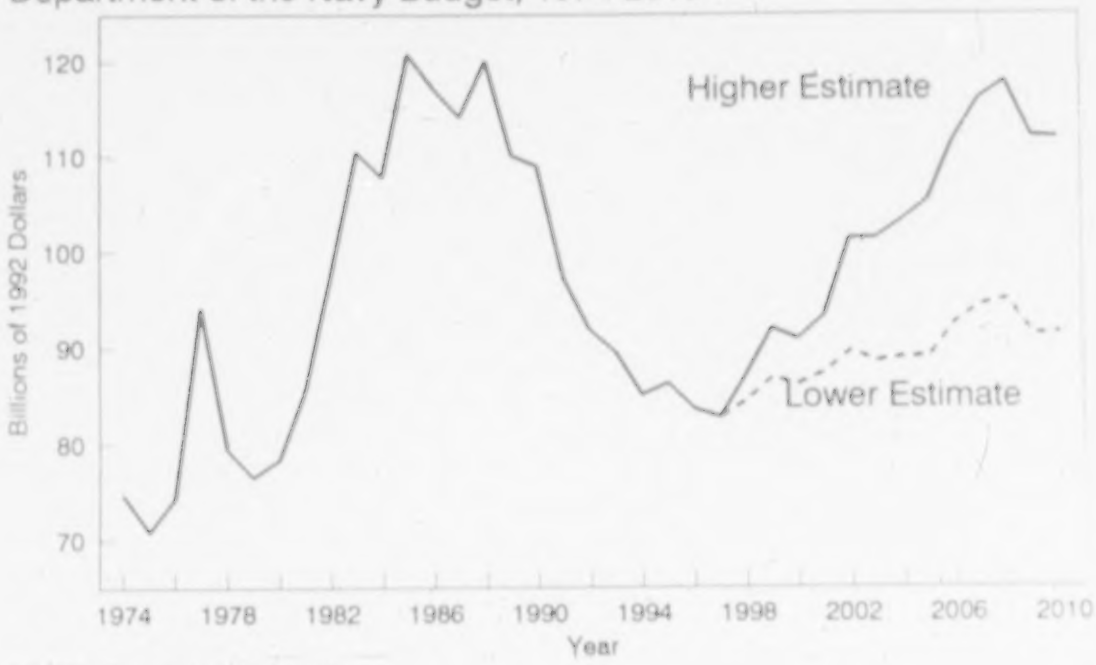
Beyond 1997, however, CBO estimates that the Navy would require substantial real increases in its budget even to maintain the smaller fleet envisioned under the Administration's plan. Because costs are uncertain, CBO presents lower and higher estimates. Under the lower estimate of costs that assumes that the Navy adopts policies to hold down procurement costs, the Navy would require annual real growth of about 0.9 percent in its budget in the 1997-2010 period. By 2010, the Navy budget would be about $91 billion compared to $81 billion in 1997 (see Figure 1). Under the higher estimate of costs, which assumes higher acquisition costs, the Navy would require annual real growth at a rate of 2.5 percent after 1997. By 2010, its budget would total $112 billion, about $31 billion a year more than the Administration's planned spending for 1997.

Under the higher estimate, the Navy's budget would have to grow dramatically after 2005 (see Figure 1). Budgets would increase primarily because of the need to procure new aircraft--particularly the AX and F/A-18 aircraft and replacements for the EA-6 and other carrier-based support planes--and because of the prices these systems would command. Budgets would also have to grow to finance the purchase of new ships--especially destroyers and attack submarines, which are also likely to be quite expensive.

The lower estimates of future costs assume that the Navy adopts policies that hold down the cost of new weapons, in some cases by designing new weapons that are cheaper, and in others by avoiding unplanned growth in the cost of new weapons. The higher estimates assume that, consistent with past experience, weapons procurement costs would exceed early estimates. The higher estimates also assume that, consistent with past experience, procurement costs that cannot be related directly to the number of ships and aircraft--such as those that pay for supporting weapons and modifications--would increase in relation to the costs of procuring ships and aircraft.

The remainder of this staff memorandum describes the analysis that underlies these estimates. The memorandum focuses on estimates of pro-

Figure 1.
Department of the Navy Budget, 1974-2010



SOURCE: Congressional Budget Office.
NOTE: Data for 1998 to 2010 are CBO estimates.

curement costs, because they have the greatest effect on the total budget, but also discusses personnel, operating, and other costs.

PROCUREMENT

CBO used the Administration's procurement plans through 1997, as submitted by the Administration in February 1991 and amended in April 1991. Because the Administration's plans are not publicly available for the years after 1997, CBO estimated procurement costs from 1998 through 2010. These costs were examined in three broad categories: ships, aircraft, and the remaining procurement items. As noted above, within each category CBO developed a lower and a higher estimate for weapons bought after 1997.

Procurement of Ships, 1992 to 1997

Between 1992 and 1997, the Administration plans to spend an average of about $7.8 billion a year in the Shipbuilding and Conversion, Navy (SCN) account, which provides funds to buy and modify the Navy's ships (see Table 2). The Administration's planned spending for shipbuilding is low when compared with past standards. For example, since 1950, annual SCN funding has averaged about $12 billion. Indeed, the Administration's planned spending in the SCN account from 1992 through 1997 would be lower in real terms than in any six-year period since 1950.[1] Under the Administration's plan the SCN account would average about 19 percent less per year than it did from 1973 to 1980, a period of lower defense spending. The average annual SCN appropriation from 1992 through 1997 would average about 41 percent less than the average annual figure during the 1980s, a decade of larger defense budgets.

While low by comparison with spending in the past, the Navy's planned SCN spending would buy a number of different types of ships, as outlined in Table 2. The key features in the Administration's shipbuilding request are a new aircraft carrier in 1995, continued procurement of DDG-51 Arleigh Burke class guided missile destroyers and SSN-21 Seawolf class attack submarines, and the introduction of a new class of amphibious warfare ship, designated the LX, in 1995.

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1. CBO did not examine data prior to 1950.

TABLE 2. ADMINISTRATION'S SHIPBUILDING AND CONVERSION PLAN AND BUDGET, 1992-1997

Type of Ship	1992	1993	1994	1995	1996	1997
CVN-68 Aircraft Carrier	0	0	0	1	0	0
SSN-21 Attack Submarine	1	1	1	1	2	1
DDG-51 Destroyer	5	4	3	3	4	3
LX New Amphibious Ship	0	0	0	1	0	1
MHC-51 Coastal Mine Hunter	2	2	1	0	0	0
MHC-51 Variant	0	0	0	1	0	2
AR Repair Ship	0	0	0	0	1	0
LSD-41 Amphibious Ship	1	1	0	0	0	0
TAGOS Surveillance Ship	0	1	1	2	0	0
ARS Rescue Ship	0	0	1	0	2	0
AOE-6 Fast Combat Support Ship	1	0	0	0	0	0
AGOR Oceanographic Research Ship	2	1	0	2	2	0
Total Ships	12	10	7	11	11	7
Shipbuilding Budget (Billions of constant 1992 dollars of budget authority)	8.5	8.0	6.1	9.6	8.5	6.4

SOURCE: Congressional Budget Office based on Department of the Navy data.

NOTE: The Navy does not include AGORs in its count of battle force ships.

Procurement of Ships, 1998 to 2010

CBO estimated the number of ships that the Navy would need to buy from 1998 through 2010 in order to maintain the force levels that Navy officials have cited as long-term goals. The key force levels are 12 aircraft carriers, 18 strategic ballistic missile submarines, 80 attack submarines, 150 surface combatants (cruisers, destroyers, and frigates), and enough amphibious warfare ships to transport two and one-half Marine Expeditionary Brigades (about 34,000 Marines, their equipment, and enough supplies for 30 days of combat).

CBO projected that the ships in the fleet today will retire at the end of an assumed service life, which varies by type of ship (see Table 3). Of course, the Navy could keep ships in the fleet longer than implied by their service life, which would reduce procurement needs. Ships do not last forever, however, and the assumptions about service life imply a pace of modernization that is consistent with Navy planning and recent experience.

The Navy would have to buy many different types of ships between 1998 and 2010 to maintain its planned forces (see Table 4). Despite the wide variety of ships, CBO estimates that about two-thirds of the shipbuilding funds that would be required from 1998 through 2010 will be devoted to acquiring new destroyers and attack submarines. Thus, these two categories of ships deserve special examination.

Destroyers. Beyond 1997, this memorandum assumes that the Navy continues to buy enough ships to support a fleet of 150 surface combatants, although these ships may not all be of the DDG-51 class. The Navy is studying designs for a less expensive destroyer or surface combatant to follow the DDG-51s. To reduce costs, designers are considering destroyers equipped with anti-air warfare systems that will be less expensive, and presumably less capable, than those on the DDG-51s. The Navy is also considering ships that are developed for specific missions, such as anti-air or antisubmarine warfare. The design and development of ships usually takes many years. This memorandum assumes that it would take about 10 years to design and develop a less expensive surface combatant, and therefore that the Navy could begin purchasing less expensive surface combatants early in the next decade.

For the purpose of estimating the cost of the Administration's long-term plan, this memorandum assumes that the Navy would continue to buy new surface combatants in each year through 2010, either DDG-51s or ships of a succeeding class, and would retire 24 of the FFG-7 Oliver Hazard Perry class frigates early in order to hold the fleet to the desired level of 150 surface

TABLE 3. SERVICE LIVES ASSUMED FOR DIFFERENT TYPES OF SHIPS

Type of Ship	Service Life Assumed (Years)
Ballistic Missile Submarines	30
Attack Submarines	30
Aircraft Carriers	45
Cruisers	40 or 30[a]
Destroyers	40
Frigates	20 to 30[b]
Amphibious Warfare Ships	35
Mine Warfare Ships	30
Patrol Combatants	30
Combat Logistics Ships	40
Other Support Ships	40

SOURCE: Congressional Budget Office.

a. CBO assumed a service life of 40 years for CG-47 Ticonderoga class cruisers and 30 years for others.
b. CBO assumed a service life of less than 30 years for 24 of the FFG-7 frigates to avoid increasing the fleet of 150 surface combatants, while maintaining construction of destroyers to replace them.

TABLE 4. SHIP PROCUREMENT, 1998-2010

Designator[a]	Description	1998-2004	2005-2010
AGF	Command ship	1	1
AOE	Logistics station ship	2	5
AOEV	Logistics shuttle ship	3	7
AR	Repair ship	0	2
AS	Submarine tender	1	2
ATR	Rescue and salvage ship	0	3
CVN	Aircraft carrier	3	0
DDG	Guided missile destroyer	14	24
LHD	Amphibious assault ship	0	3
LX	New amphibious ship	13	0
MHC	Coastal mine hunter	2	0
PHM	Small combatant	1	5
SSBN	Ballistic missile submarine	0	6
SSN	Attack submarine	17	22
	Total	57	80

SOURCE: Congressional Budget Office.

a. Designators are symbols used by the Navy to represent types of ships. They are not abbreviations.

combatants. The 24 frigates would be retired when they are between 20 and 30 years old, with average retirement coming after 23 years, instead of their expected service life of 30 years.

The Navy would not need to buy surface combatants continuously during the 1992-2010 period in order to maintain a fleet of 150 ships. If the Administration purchases all of the DDG-51s in its 1992-1997 shipbuilding plan, the Navy would field well over 150 surface combatants through the year 2010, even if no additional vessels were purchased until 2005. The Navy has not discussed how it might deal with this potential surplus of surface ships in the next decade. But, in order to keep open one shipyard capable of building surface combatants and modernizing its fleet, the Navy will probably respond as assumed in this memorandum.

Some might argue that this memorandum includes artificially high shipbuilding costs because CBO assumes that the Navy would continue to produce destroyers, even when they are not required to meet Navy force goals. The alternative to the approach taken in this memorandum, however, would be to stop building new surface combatants entirely from the late 1990s until the middle of the next decade, when construction would have to begin on new ships required to replace the 51-FFG-7s when they reach retirement age.

CBO's projection did not discontinue surface combatant production because of the uncertain costs that this approach would have on the shipbuilding industry. If the Navy ceases to order new surface combatants, the skilled shipyard workers who build these vessels would probably seek new employment, and the shipbuilding facilities would be converted to other endeavors, or cease operating. Regaining the skills and facilities that would be necessary to resume the production of new surface combatants could be expensive, and restarting could take many years. Because of these potential problems, CBO continued surface combatant procurement, albeit at a low rate of two a year, until replacements for the FFG-7s are needed later in the next decade. While stopping production of surface combatants for several years is indeed a possibility, the Administration has not said it will do so.

Attack Submarines. This memorandum assumes that from 1998 to 2010 the Administration will increase production of attack submarines to an average rate of about three a year. In view of the impending retirement of older SSN-688 class submarines during the next decade, this rate of production would attain the Navy's goal of maintaining about 80 attack submarines.

Some of the attack submarines bought in the next decade may not be of the SSN-21 class. The Navy recently began studying designs for a new class

of attack submarine, named the Centurion, which could be bought in coming years instead of, or in addition to, the SSN-21. Navy officials have stated that the goal of the Centurion program is to develop a submarine that is more affordable than the SSN-21, but that also maintains U.S. superiority in attack submarine technology. The Navy is in the process of developing specifications for the Centurion. This memorandum assumes that production of Centurion submarines begins in the year 2002.

Aircraft Carriers. CBO estimates that the Navy will need to purchase three aircraft carriers shortly after 1997 to maintain a fleet of 12 carriers. The three new carriers would be needed to replace carriers that reach the end of their service life in the middle of the next decade. The Navy would have some flexibility in deciding exactly which years it would seek funding for new carriers. CBO assumed that the new carriers would be funded in 1999, 2001, and 2002. CBO selected these years to buy carriers in order to prevent precipitous increases in the shipbuilding budget in any one year.

Assumptions About Ship Costs. This memorandum presents lower and higher estimates of costs to reflect the uncertainty about the future costs of weapons. The lower estimates assume that the Navy adopts policies that hold down weapon costs. For the lower estimates, this memorandum assumes that beginning in 2002, new destroyers and attack submarines would cost one-third less than today's DDG-51 destroyers and SSN-21 submarines (see Table 5). Historically, weapons have tended to grow more expensive, not less. The lower cost estimates therefore assume an unprecedented effort by the Navy to design and field less expensive weapons.

For the higher cost estimates, this study assumes that attack submarines and destroyers will continue to cost the same as today's SSN-21 and DDG-51 vessels. The higher cost estimates therefore do not reflect the possibility of increases in costs for attack submarines and destroyers.

Under the lower cost estimates, this memorandum assumes that the real costs will not change for other types of ships that the Navy must buy to maintain its desired fleet size. For types of ships that have not been built for many years, this memorandum assumes that new ships would cost the same, in real terms, as the ships that they will replace (see Table 5).

The higher cost estimates are more consistent with past experience. For these estimates, the cost of new ships is assumed to increase by about 3 percent a year in real terms above current prices. CBO used a rate of 3 percent a year because that is the rate of growth in cost that the Navy experienced between generations of destroyers, from the DDG-2 (Adams

TABLE 5. UNIT PROCUREMENT COSTS FOR SHIPS
(In millions of 1992 dollars)

Designator[a]	Description	Lower Unit Cost	Higher Unit Cost
AGF	Command ship	350	400
AOE	Logistics station ship	500	600
AOEV	New logistics ship	300	400
AR	Repair ship	500	600
AS	Submarine tender	400	500
ATR	Rescue and salvage ship	100	100
CVN	Aircraft carrier	4,000	4,900
DDG	Guided missile destroyer	600	850
LHD	Amphibious assault ship	1,000	1,200
LX	New amphibious ship	400	500
MHC	Coastal mine hunter	100	100
PHM	Patrol combatant	100	100
SSBN	Ballistic missile submarine	1,400	1,700
SSN	Attack submarine	1,400	2,000

SOURCE: Congressional Budget Office.

a. Designators are symbols used by the Navy to represent types of ships. They are not abbreviations.

class) in the 1960s to the DDG-51 in the 1990s. Other classes of ships have experienced higher rates of cost increases between generations. For example, unit costs rose in real terms by almost 5 percent a year between the 1960s-era SSN-637 (Sturgeon class) attack submarines and the SSN-21 class. Nevertheless, real growth of 3 percent a year is a reasonable guide to the Navy's experience with cost increases. CBO assumed that costs would grow by 3 percent beginning in 1998, which means that the higher unit costs of ships--other than destroyers and attack submarines, which were discussed previously--exceed the lower costs by about 20 percent.

Estimates of Shipbuilding Costs Under the Administration's Plan, 1998 to 2010

Under the lower cost assumptions, from 1998 through 2010 the shipbuilding and conversion account would average about $10.2 billion per year. This funding would represent an increase of about 30 percent over the average annual spending proposed by the Administration for the 1992-1997 period.

Under the higher cost assumptions, where procurement prices are assumed to increase as they have in the past, the SCN account would average about $13.1 billion a year from 1998 to 2010, about $5.2 billion or 67 percent more per year than the Administration plans to spend on average from 1992 to 1997. During the 1980s, SCN averaged about $13.4 billion a year. To maintain planned force levels, therefore, the Administration would have to fund the SCN account during the 1998-2010 period at levels comparable to those of the 1980s, if the unit costs for ships rise as they have in the past.

Both lower and higher estimates are based on assumptions about spending on portions of the SCN account that cannot be related directly to the numbers of ships. A portion of SCN funding--averaging about 7 percent during the 1992-1997 period--pays for smaller vessels, landing craft that ferry Marines from ship to shore, and miscellaneous other costs that are not tied directly to annual purchases of new combat ships. Both estimates assume that these costs would remain at about 7 percent of the SCN budget.

The cost of new destroyers and attack submarines will determine whether the Navy will require shipbuilding funds that are closer to the higher or lower cost estimate. About 70 percent of the difference between the lower and higher shipbuilding cost estimates can be attributed to differences in the costs assumed for destroyers and submarines.

Procurement of Naval Aircraft, 1992 to 1997

The Administration has published its planned funding for the Aircraft Procurement, Navy (APN) budget account for 1992 through 1997 (see Table 6). According to the Administration's plan, funding in the APN account will average about $7.7 billion from 1992 through 1997; lower than in any six-year period since 1974, the year in which the APN account was created. Average annual funding in the APN account during the 1992-1997 period would be about $0.5 billion a year or 6 percent lower than average spending from 1974 through 1979, a period of lower defense spending, and about $4 billion a year or 34 percent lower than average spending from 1980 to 1989, a period of higher defense spending.

The F/A-18 aircraft, a plane designed to carry out both attack and fighter missions, is the only fighter or attack aircraft that the Navy plans to buy in the 1992-1997 period (see Table 6). The service proposes to buy 348 F/A-18s over the period. Beginning in 1996, the Navy will begin to buy the E/F version of the F/A-18. The E/F version will be larger than today's C/D version, which will give the aircraft longer range and allow it to carry a heavier payload. The Navy plans to begin development of the E/F version in 1992 and to begin purchasing E/Fs in 1996. In 1996 and 1997, the Navy plans to buy some of both the C/D and E/F versions.

The Navy also plans to buy 12 E-2C Hawkeye early warning aircraft, 204 T-45 Goshawk training aircraft, and 312 helicopters of different types in the 1992-1997 period. In addition, the Navy plans to remanufacture 45 EA-6B Prowler electronic warfare aircraft. The remanufacturing program will provide existing EA-6s with improved avionics.

Procurement of Naval Aircraft, 1998 to 2010

CBO estimated the number of naval aircraft that would be bought after 1997 (see Table 7). For a few types of aircraft, the Administration has announced planned purchases for the 1998-2010 period. CBO used these plans when they were available.

For most types of aircraft, however, the Administration's plans are not publicly available. For these, CBO first projected aircraft retirements during the next decade. Based on these, CBO determined the need to buy specific types of aircraft.

TABLE 6. ADMINISTRATION'S PROCUREMENT PLAN AND BUDGET FOR NAVY COMBAT AIRCRAFT, 1992-1997

Aircraft	1992	1993	1994	1995	1996	1997
EA-6B[a, b]	0	-3	-9	-9	-12	-12
F/A-18	48	48	48	54	66	84
CH/MH-53E	20	20	20	0	0	0
Medium-Lift Replacement	0	0	0	0	0	12
AH-1W	12	12	12	12	12	12
SH-60B	12	12	12	12	12	12
SH-60F	12	12	12	12	12	12
E-2C	6	6	0	0	0	0
T-45TS[b]	-12	-12	-36	-48	-48	-48
HH-60H	9	7	8	0	0	0
Total Combat Aircraft	119	117	112	90	102	132
Procurement Budget (Billions of constant 1992 dollars of budget authority)	8.0	7.1	7.6	6.8	7.7	9.0

SOURCE: Congressional Budget Office using Department of the Navy data.

a. Remanufactured aircraft only.
b. Not included in total combat aircraft.

TABLE 7. NAVY AIRCRAFT PROCUREMENT, 1998-2010

Aircraft	1998-2004	2005-2010
AX	84	216
AH-1	0	10
S-3/EA-6/E-2C/ATS	30	72
CH/MH-53	82	66
CH-60B/Medium Lift Replacement	266	60
F/A-18/Successor	372	340
P-3 Replacement	135	126
SH-60	28	104
Total	997	994

SOURCE: Congressional Budget Office.

CBO then estimated the number of aircraft of each type that would be purchased. In most cases, the estimate of the number of aircraft bought per year is based on past purchases of similar types of aircraft. For a few types of aircraft--some helicopters and land-based antisubmarine aircraft--CBO allocated enough aircraft to eliminate shortages. Even if the Navy buys all of the aircraft that this memorandum assumes, however, it would still face a substantial shortage of aircraft in the year 2010. Aircraft are discussed below in three categories: for carriers, the Marine Corps, and antisubmarine warfare.

Aircraft for Aircraft Carriers. The Navy's long-term plans call for maintaining 11 active and two reserve carrier air wings, one wing less than today's total of 14. Each wing consists of between 80 and 85 aircraft. The composition of the different air wings that the Navy intends to operate through 2010 is outlined in Table 8. The number of the different types of wings that CBO estimates the Navy plans to field in each year through 2010 are listed in Table 9.

The Navy plans to replace its aging A-6E Intruder attack aircraft with the AX, a stealth aircraft. Development of the AX would begin in 1992 and procurement shortly after the turn of the century. The Navy recently solicited concept studies from industry, the first step in designing the AX. In its solicitation, the Navy proposed beginning AX production in 2001 and gradually increasing production to 36 AXs a year. This memorandum uses the Navy's proposed production schedule, and buys about 300 AX aircraft from 2001 through 2010.

The Navy plans to replace its long-range F-14 Tomcat fighters with the E/F version of the F/A-18 Hornet. Until recently, the Navy had planned to replace the F-14s with a naval version of the Air Force's Advanced Tactical Fighter (ATF). The Navy has announced that it no longer plans to buy the ATF.

The Navy must buy a substantial number of new fighter and attack aircraft after 1997 because many of today's F-14 Tomcat fighters and A-6 Intruder attack aircraft will reach the end of their expected service lives before 2010, and replacements must be acquired to avoid significant shortages of carrier-based aircraft.[2]

This memorandum assumes that the Navy would purchase 492 F/A-18s in the 1998-2010 period to replace its retiring F-14s and older F/A-18s. This memorandum assumes that the Navy would continue to buy 84 F/A-18s a

2. See Statement of Robert F. Hale before the Subcommittee on Defense, Committee on Appropriations, United States Senate, May 8, 1991.

TABLE 8. NUMBER OF AIRCRAFT PER AIRCRAFT CARRIER AIR WING

Type of Aircraft	Type of Air Wing			
	Conventional	Roosevelt	Transitional	21st Century
Fighter (F-14)	24	20	20	0
Strike/Fighter (F/A-18)	24	20	20	42[a]
Attack (A-6, A-X)	14	20	16	18
ASW (S-3)	6	6	6	0
Electronic Warfare (EA-6)	4	5	5	16[b]
Early Warning (E-2)	4	5	5	0
Helicopters for Antisubmarine Warfare (SH-3, SH-60, HH-60)	6	8	8	8
Total	82	84	80	84

SOURCE: Congressional Budget Office based on Department of the Navy data.

a. Fighter and attack aircraft, which include F/A-18 and possibly F-14 aircraft.
b. Support aircraft, including EA-6B, S-3, E-2C, and ATS aircraft.

TABLE 9. AIRCRAFT CARRIER AIR WINGS

Type of Wing	1992	1993	1994[a]	1995	1996	1997
Conventional	2	0	0	0	0	0
Roosevelt	1	1	1	1	1	1
Transitional	8	10	10	10	10	10
21st Century	0	0	0	0	0	0
Reserve	2	2	2	2	2	2

Type of Wing	1998	1999	2000	2001	2002	2003
Conventional	0	0	0	0	0	0
Roosevelt	2	2	2	2	2	2
Transitional	9	9	9	9	9	9
21st Century	0	0	0	0	0	0
Reserve	2	2	2	2	2	2

Type of Wing	2004	2005	2006	2007	2008	2009	2010
Conventional	0	0	0	0	0	0	0
Roosevelt	0	0	0	0	0	0	0
Transitional	8	7	5	4	3	1	0
21st Century	3	4	6	7	8	10	11
Reserve	2	2	2	2	2	2	2

SOURCE: Congressional Budget Office based on Department of the Navy data.

a. Reserve air wings change from modified conventional to modified transitional in 1994.

year--the rate in the Administration's plan for 1997--through the year 2000, and would buy 30 a year in the 2001-2008 period. Additionally, this memorandum assumes that beginning in 2006, the Navy would buy 220 successors to the F/A-18. The Navy has stated that the successor to the F/A-18 could be an aircraft with short (or vertical) take-off and landing capability, and that this aircraft could also be a replacement for the Marine Corp's fleet of AV-8B Harrier aircraft.

In the absence of Navy plans for procuring F/A-18s and a possible replacement after 1997, CBO based its procurement of these aircraft on the desirability of keeping the F/A-18 production line operating, even at a low rate, until a successor aircraft is ready; on historical rates of production; and on limiting shortages of naval combat aircraft at the end of the next decade.

In addition to fighter and attack aircraft, the Navy will have to buy other types of carrier-based aircraft in the years beyond 1997. Aircraft carrier air wings include EA-6B Prowler electronic warfare aircraft, E-2C Hawkeye early warning aircraft, and S-3 Viking antisubmarine warfare aircraft. Many EA-6B Prowler, E-2C Hawkeye, and S-3 Viking aircraft will reach the end of their expected service lives before 2010. As recently as October 1990, the Navy planned to replace these three types of aircraft with a single new model, the Advanced Tactical Support (ATS) aircraft. Since that time, however, the Navy canceled the ATS program. If the Navy is not able to extend the service lives of these aircraft, it must either buy replacements for them or accept shortages in its air wings. This memorandum assumes that the Navy will purchase about 12 aircraft a year, beginning in 2002, to replace EA-6B, E-2C, and S-3 aircraft (see Table 7). The assumed purchase of 12 planes a year is based on similarly small purchases of these types of aircraft in earlier years.

Aircraft for the Marine Corps. The Marine Corps operates three active and one reserve air wings. During the next 20 years many of the Corps' aircraft, including CH-46 Sea Knight helicopters and AV-8B Harrier jump jets, will reach the end of their expected service lives. According to the most recent plans that are publicly available, the Navy plans to replace the CH-46s with a new helicopter called the Medium Lift Replacement, which it plans to begin buying in 1997, and to replace the AV-8s with a new aircraft--possibly one with vertical take-off and landing capability--during the next decade. This memorandum assumes that the Navy will buy 148 CH-53 heavy lift helicopters, 326 CH-60 medium lift helicopters, and about 220 short take-off and landing fighter/attack aircraft in the 1998-2010 period (see Table 7).[3]

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3. CBO assumed that some of the short take-off and landing aircraft will be used by the Marine Corps to replace aging AV-8Bs, and some would be used by the Navy to replace aging F/A-18s.

Land-Based Aircraft for Antisubmarine Warfare. By the mid-1990s the Navy will operate 18 active and nine reserve squadrons of P-3 Orion antisubmarine warfare aircraft from land bases. Based on its assumed service life, many of the P-3s will also be retired in the next decade. Last year the Navy canceled development of the P-7 aircraft, which was to replace the P-3. The Navy has not announced how it plans to cope with the impending retirements of the P-3s in the wake of the P-7 cancellation. This memorandum assumes that the Navy will begin purchasing a new aircraft around the turn of the century, and would buy 261 aircraft through 2010. This purchase would be sufficient to prevent a shortage of land-based aircraft for antisubmarine warfare at the end of the next decade.

Assumptions About Aircraft Costs. CBO estimated lower and higher costs for aircraft to reflect uncertainty about costs (see Table 10). For most types of aircraft, CBO's lower cost estimates are based on current Navy projections. For those aircraft for which no Navy projections are available, this memorandum assumes that new aircraft would cost about the same as those they will replace, adjusted only for the effects of inflation.

For example, based on data from the Department of Defense, CBO estimates that the procurement cost per unit of the E/F version of the F/A-18 will be about $60 million, a 50 percent increase over today's C/D version. Based on statements by Navy officials, CBO estimates that the procurement cost per unit of the AX could amount to about $100 million, about the same as the A-12 Avenger aircraft that the Secretary of Defense canceled in January 1991. Cost estimates for the AX are especially uncertain, however, because the Navy has not settled on a design for the aircraft.

For the higher cost estimates, this memorandum assumes that unit procurement costs would increase above current Navy projections as they have in the past. The assumed rate of growth varies depending on the type of aircraft. CBO has assumed a cost increase of about 25 percent for aircraft that will enter production relatively soon, such as F/A-18E/F. For aircraft that will enter production in the next decade, including the AX, growth of about 50 percent is assumed. Growth of this magnitude is roughly consistent with studies of cost growth in the past.[4]

Under the higher estimate, CBO assumed that the cost of replacements for the S-3, EA-6, and E-2C aircraft would equal the Navy's planned cost of the AX.

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4. See Gary R. Bliss, "The Accuracy of Weapons Systems Cost Estimates," paper delivered to the 59th Military Operations Research Symposium, U.S. Military Academy, June 12, 1991.

TABLE 10. UNIT PROCUREMENT COST ESTIMATES FOR AIRCRAFT
(In millions of 1992 dollars)

Type of Aircraft	Lower Unit Cost	Higher Unit Cost
AX	100	160
AH-1W	10	15
S-3/EA-6/E-2C/ATS[a]	70	100
CH/MH-53	30	40
CH-60B	30	40
F/A-18/Successor	60	75
P-3 Replacement	50	60
SH-60 Lamps	30	40

SOURCE: Congressional Budget Office.

a. Includes any possible replacements for S-3, EA-6, and E-2C aircraft.

A projected cost for the P-3 replacement is not available; CBO assumed a unit procurement cost of $50 million in the lower estimate, about the cost of the current P-3 aircraft, and $60 million in the higher.

Both the lower and higher cost estimates make assumptions about portions of the APN account that are not directly related to the number of aircraft purchased.

Trends in Aircraft Procurement Funding. Even under the lower cost assumptions, funding for naval combat aircraft would have to increase dramatically from 1998 through 2010 to support the Administration's plan. Under those assumptions, in the 1998-2010 period the Navy's budget for combat aircraft would average about $8.8 billion annually, an increase of about $4.3 billion a year over the Administration's planned average funding from 1992 through 1997. During the 1980s, combat aircraft funding averaged about $7.2 billion a year. Thus, under the lower cost estimates, funding for combat aircraft in the 1998-2010 period would average about $1.5 billion a year more than it did during the 1980s, a period of relatively high defense budgets.

Under the higher cost estimates, which assume that procurement costs rise as they have in the past, funding for combat aircraft procurement must increase even more. From 1998 through 2010, funding for combat aircraft would have to average about $11.9 billion a year, almost 2.7 times the annual funding that the Administration proposes for the 1992-1997 period, and almost 65 percent more each year (about $4.7 billion a year) than the average during the 1980s.

Shortages of Aircraft

Even if the Navy makes these large investments in aircraft, CBO estimates that by 2010 the Navy would have a shortage of about 400 aircraft, or 12 percent of its total requirements. The largest shortfalls would be in carrier-based support aircraft, such as the EA-6B Prowler, S-3 Viking, E-2 Hawkeye, and Advanced Tactical Support aircraft, and in carrier-based fighter and attack aircraft. These shortages assume the levels of aircraft procurement discussed earlier as well as retirement ages for older aircraft that are based on data supplied by the Navy (see Table 11).

The Navy could cope with the shortage of combat aircraft in several ways. One approach would be to extend the service life of aircraft. CBO estimates that the Navy could eliminate the shortage by keeping several types

TABLE 11. SERVICE LIVES ASSUMED FOR SELECTED TYPES OF AIRCRAFT

Type of Aircraft	Service Life Assumed (Years)
A-6E Intruder	32
AV-8B Harrier	20
E-2C Hawkeye	22
EA-6B Prowler	35
F-14 Tomcat	27
F/A-18 Hornet	20
P-3 Orion	30
S-3 Viking	24

SOURCE: Congressional Budget Office from the Department of the Navy.

of aircraft--especially F/A-18s, A-6s, AV-8Bs, EA-6Bs, and S-3s--in the fleet for a few more years than assumed; two to four more years for these types except the S-3s, which would require an additional 11 years of service life. But the Navy may find it difficult to extend service lives much longer. In this event, the Navy could operate with a shortage of aircraft, which it has done before. One way to accommodate shortfalls in peacetime is to "crossdeck" aircraft; that is, move aircraft from a carrier that is just returning from a tour of duty to one that is about to depart. Crossdecking insures that carriers can sail with a full load of aircraft in peacetime, but aircraft shortfalls would degrade capability in a war when most carriers would be expected to be on station. Finally, the Navy could buy new aircraft to fill the gap. Buying enough new aircraft to avoid any shortage would require additional funding for combat aircraft procurement in the 1998-2010 period--about $33 billion under the lower estimate and $48 billion under the higher estimate.

Nonmajor Procurement, 1992 to 2010

Aside from ships and aircraft, the Navy also purchases many other types of weapons systems and equipment. These purchases are funded in portions of its aircraft procurement (APN) budget account and in three other budget accounts: Weapons Procurement, Navy (WPN); Other Procurement, Navy (OPN); and Procurement, Marine Corps (PMC). Portions of the APN account pay for modifications, spare parts, and support equipment. The WPN budget funds the procurement of Trident strategic ballistic missiles, tactical guided missiles such as the Tomahawk and Harpoon, torpedoes, guns, and other ordnance. Communications and support equipment are funded in the OPN account. The Marine Corps buys all of its ground weapons--ammunition, weapons, vehicles, and communications and support equipment--through the PMC account.[5]

CBO used the Administration's projected budgets for these categories of spending for the 1992-1997 period. For the 1998-2010 period, lower and higher cost estimates were computed in different ways.

The lower estimate for nonmajor procurement is based on the assumption that the Navy will eventually return to steady state rates of procurement for these programs. For these estimates, however, that rate of procurement would be lower than in the past only because the forces that drive procurement will be reduced. The lower estimate treats nonmajor procurement programs as independent programs from major procurement.

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5. Aircraft for the Marine Corps are purchased with funds from the Aircraft Procurement, Navy budget account.

It assumes, for example, that the Navy will not increase funding for ballistic missiles because it buys more attack aircraft, or similarly that it will continue to fund communications equipment even when it may not be buying new aircraft carriers.

Specifically, for the lower cost estimate CBO assumed that by 2003 funding for nonmajor procurement would equal the average level of funding for the 1974 to 1993 period. The average for the 1974-1993 period was decreased, however, in proportion to changes in the size of the Navy's forces from 1991 to 1997. For example, under the Administration's plan the number of ships will decrease by 15 percent between 1991 and 1997, so CBO's estimate of funding for ship support equipment is the average value from 1974 to 1993, decreased by 15 percent. CBO assumed that these costs would increase or decrease linearly from the 1997 level in the Administration's most recent budget to the adjusted 1974-1993 average value CBO assumed for 2003. The lower cost estimate also assumed that costs in these categories remain constant from 2003 to 2010.

Under the lower cost estimates, CBO estimates that spending for nonmajor procurement would total $12.2 billion in 2010, compared with $12.5 billion under the Administration's plan for 1997.

Under the higher estimates, CBO projected costs for the nonmajor procurement spending using ordinary least squares regression.[6] The regression equation and results are outlined in Table 12. The regression assumes that funding for nonmajor procurement is a function of two variables: funding for ships and combat aircraft in each budget year and funding for nonmajor procurement in the previous year. The regression shows a statistically significant relationship for both of these variables, and is based on data from 1974 through the Administration's planned spending for 1993.

Under the higher cost estimate, funding for nonmajor procurement would increase as funding for ships and combat aircraft increases. This may be consistent with the nature of the systems purchased with these funds. Some weapons systems that are bought with these funds--such as precision-guided munitions, satellites, radars, and communications gear--could become obsolete in the next decade, either because of improvement in enemy systems or because of old age. Thus, it might be reasonable to expect that the military would develop new versions of these weapons in the next decade, even if the Navy does not increase in size. These systems, many of which incorporate state-of-the-art technologies, could display the same types of cost trends as

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6. Ordinary least squares is a widely used statistical technique that establishes a quantitative relationship between different variables.

TABLE 12. REGRESSION USED TO ESTIMATE NONMAJOR PROCUREMENT

$$Y = 1.655 + \underset{(2.61)}{0.218X_1} + \underset{(5.80)}{0.657X_2}$$

R - Squared = 0.82

Where Y = Funding for nonmajor procurement, defined as all of the Aircraft Procurement, Navy budget account except for combat aircraft, and all of the Other Procurement, Navy; Weapon Procurement, Navy, and Procurement, Marine Corps budget accounts.

X_1 = Funding for combat aircraft and the Shipbuilding and Conversion, Navy budget account.

X_2 = Funding for nonmajor procurement in the preceding year.

SOURCE: Congressional Budget Office.

NOTE: Sample period: 1975 to 1993. Numbers in parenthesis are "t" statistics. Data are expressed in billions of constant 1992 dollars.

major procurement; that is, new models would tend to cost significantly more than their predecessors and actual costs would tend to exceed estimated costs. For all these reasons, the costs of sophisticated weapons bought out of funds for nonmajor procurement might well vary as a function of the costs of combat aircraft and ships. This expectation is consistent with the regression relationship, which shows a statistically significant relationship between funding for nonmajor procurement and that for ships and aircraft.

Under the higher cost estimate, nonmajor procurement spending would increase to $23.2 billion in 2010, compared with $12.5 billion under the Administration's plan for 1997 and $12.2 under the lower cost estimate for 2010.

Total Procurement Funding, 1992 to 2010

The three areas discussed above--ships, aircraft; and nonmajor procurement--define the Navy's total procurement needs. The Administration's planned procurement budget for the Department of the Navy declines from $37 billion in 1990 to $25 billion in 1997, a reduction of about $12 billion or 34 percent. This reduction suggests annual real declines averaging 5.7 percent a year from 1990 through 1997.

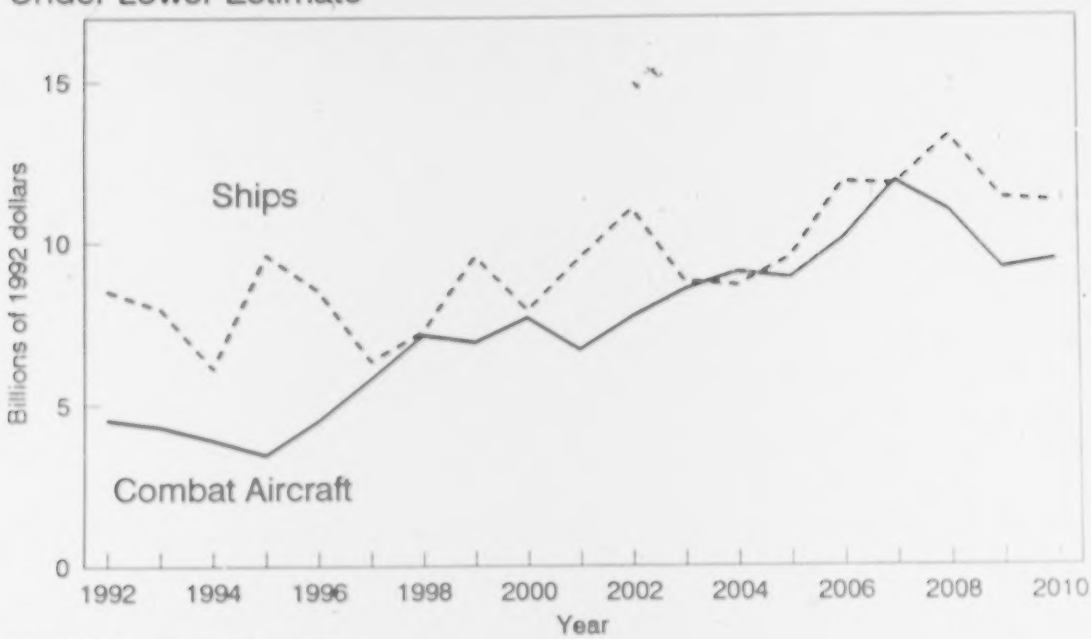
Under both lower and higher cost estimates, the Navy will require significant growth in procurement funding in the 1998-2010 period to buy the equipment necessary to maintain the Administration's planned force levels.

Under the lower cost estimate, which assumes that the unit costs for new weapons do not grow above planned levels, procurement funds would require real growth of about 2.2 percent a year from 1997 to 2010. The procurement budget in 2010 would total about $33 billion, an increase of about $8 billion, or one-third more than the Navy's planned procurement spending in 1997.

Under the higher estimate, which assumes that costs for new weapons increase as they have in the past, the procurement budget would require real growth of about 5.7 percent a year to maintain the Administration's planned force levels. By 2010, the procurement budget would be about $52 billion, more than twice the procurement budget planned for 1997.

Patterns in required funding differ for ships and aircraft (see Figure 2). Ship procurement funds increase from 1997 through about 2002 because CBO assumes that the Navy must buy new aircraft carriers in these years. After 2002, however, CBO estimates that the need for shipbuilding funds will fall through about 2005. After 2005, shipbuilding funds would have to increase

Figure 2.
Ship and Combat Aircraft Procurement
Under Lower Estimate



SOURCE: Congressional Budget Office.

dramatically to pay for replacements for SSN-688 class submarines and FFG-7 class frigates that will reach retirement age. In contrast, the budget for combat aircraft requires steady increases in funding from 1997 through 2005, but also requires substantial increases after 2005 to pay for replacements for retiring aircraft, especially A-6s, F/A-18s, AV-8Bs, and F-14s.

MILITARY PERSONNEL

In general, funding for military personnel varies with the number of sailors and Marines in uniform. The Administration plans to reduce the number of active duty personnel in the Navy to about 502,000 in 1997, a reduction of 81,000, or about 14 percent lower than the 1990 level. Under the Administration's plan, the number of active duty Marines would decline to 159,000 in 1997, a reduction of about 38,000, or 19 percent compared with 1990.

The Administration's proposed funding for the military personnel budget accounts reflects the smaller Navy and Marine Corps. In 1997, the Administration proposes to spend about $24 billion on military personnel, compared with $29 billion in 1990. By 1997, therefore, the Administration plans to reduce spending on military personnel in the Department of the Navy by about $5 billion, or about 17 percent less than spending in 1990.

CBO estimates that personnel costs will remain at $24 billion a year through 2010 because the number of people in the Navy is assumed to stay roughly the same in the 1997-2010 period. This assumption is consistent with statements by the Chairman of the Joint Chiefs of Staff to the effect that the forces planned for the mid-1990s represent the minimum forces required to meet U.S. security needs.[7]

OPERATION AND MAINTENANCE

The operation and maintenance (O&M) budget accounts pay for the day-to-day operation of the Navy. For example, O&M funds pay for fuel for ships and aircraft and food for sailors and Marines. The accounts also include pay for civilian employees. O&M funding is directly related to the size of the Navy. As the service gets smaller, total operation costs should decline.

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7. Statement of General Colin Powell before the Committee on Armed Services, U.S. House of Representatives, February 7, 1991.

Under the Administration's plan, O&M funding for the Navy and the Marine Corps would decline from $30 billion in 1990 to $22.7 billion in 1997. Thus, the Administration proposes a real decrease in O&M funding of about 25 percent by 1997, averaging about 4.1 percent a year.

As with costs for military personnel, CBO assumed that costs for O&M would remain at their 1997 level through the year 2010. This assumption is consistent with the concept that the Administration plans to keep the size of forces roughly constant.

There is, however, much uncertainty about future requirements for O&M funds, particularly by the end of the next decade. By 2010, many weapons systems, such as the SSN-21 submarine and the AX aircraft, will have entered the inventory in substantial numbers. In some cases, the new equipment has been designed to hold down maintenance costs, which would reduce O&M costs. Still, the new weapons will be more complex than those that they replace, which could increase O&M costs.

OTHER COSTS: RESEARCH AND DEVELOPMENT, MILITARY CONSTRUCTION, AND FAMILY HOUSING

The Navy's budget also funds research and development and the construction of military bases and housing for sailors, Marines, and their families. CBO used the Administration's plan for these categories of spending from 1992 through 1997. Under the Administration's plan, spending in these accounts would total $8.9 billion in 1992, and rise to $10 billion by 1997. By contrast, these accounts totalled $12.4 billion in 1990. Proposed spending would therefore be 19 percent lower in 1997 than it was in 1990.

In the years beyond 1997, the lower cost estimate treats research and development as it did nonmajor procurement. That is, the lower cost estimate assumes that funding of research and development would increase linearly from the Administration's planned level from 1997 to 2003, when it would equal the average funding level during the 1974-1991 period. This results in research and development funding of $9.1 billion in 2003. The lower cost estimate assumes that research and development funding would remain at $9.1 billion in the 2003-2010 period.

For the higher cost estimate, CBO assumed that research and development costs would vary with the total budget for the Department of the Navy. For the higher cost estimates CBO estimated that research and development would receive the same share of the Navy's budget--9.7 percent--that it received on average from 1974 to 1991. Between 1974 and 1991, the

research and development account ranged from 7.6 percent to 10.9 percent of the Navy's budget, with a median value also at 9.7 percent. Under the higher cost estimate, research and development costs would total $10.8 billion in 2010.

CBO used the same method for applying lower and higher estimates to military construction and family housing costs in the 1998-2010 period. Both estimates assume that military construction would increase linearly from the Administration's planned level of $1.2 billion in 1997 to $1.9 billion in 2010. The estimate of $1.9 billion is based on average funding in 1974-1991, adjusted for changes in the number of military personnel. For family housing, both estimates assume that funding is proportional to the number of active-duty personnel, and, therefore, funding remains at the 1997 level of about $800 million a year.

TOTAL COSTS FOR THE DEPARTMENT OF THE NAVY

Under the Administration's plan, the total Navy budget declines by an average of about 4.7 percent a year through 1997, leaving the Navy's budget in 1997 about $27 billion lower than in 1990. Most of this reduction occurs because the Administration's plan reduces the size of the Navy and, therefore, its operating budget. Both the lower and higher estimates of costs are contingent on this reduction. These decreases are driven by the cuts imposed on the Defense Department to meet budgetary limits imposed by the Budget Enforcement Act of 1990.

In the years following 1997, particularly after 2005, the costs of the Navy's force modernization plan would increase. Costs would increase because of sharply higher costs of procuring new aircraft--particularly the AX and F/A-18 aircraft and replacements for S-3 and other carrier-based support planes--and new ships, especially destroyers and attack submarines. These new aircraft and ships are likely to be quite expensive. Because the new weapons purchases would take place in the 1998-2010 period, the Navy would require budgetary increases averaging between 0.9 percent a year, under the lower estimate, and 2.5 percent a year, under the higher estimate. The budget in 2010 would have to be increased by about $10 billion to $31 billion, compared with the level planned for 1997.

It is possible that the Navy budget will grow by enough to accommodate the Administration's plans. The required growth is substantially less than the growth of 3 percent to 5 percent a year that was associated with plans in the

mid-1980s for a 600-ship Navy.[8] Moreover, increases under the Administration's plan would be consistent with past growth in U.S. gross national product (GNP). Long-term average GNP growth has amounted to about 2 percent to 3 percent a year, which would finance most of the Administration's planned forces under the higher cost assumptions. Even if the whole defense budget remained constant in real terms or grew at a rate less than that of long-term GNP growth, the Administration and the Congress might decide to allocate a larger share of the total defense budget to the Navy. Finally, the Administration may hope to pay for some growth in costs by making its operations more efficient, although in the past the Defense Department has had difficulty achieving large dollar reductions through efficiencies.

It is also plausible to assume that, rather than increasing after 1997, the defense budget could remain constant or decline further. Moreover, the recent war in the Persian Gulf emphasized the need for a wide variety of military forces, which may preclude substantial increases in the Navy's share of the total defense budget. Thus, the Congress and the Administration may have to consider alternatives that would lower the cost of naval forces.[9]

ALTERNATIVES

The Congress has several alternatives for coping with cost increases. For example, it could reduce the size of the Navy further, which would result in savings in military personnel and operations and maintenance costs in the near term, and procurement savings over the long run. The Congress could reduce the Navy across each of its mission areas, or target specific missions or forces for reductions. For example, the Congress could reduce forces for antisubmarine warfare or others, such as aircraft carrier battlegroups, which are used to project military power far from the United States.

The Congress could also reduce costs by slowing or postponing key modernization programs. As indicated by Figure 1, the Navy's need for increased funding is particularly evident after 2005. To replace retiring systems, by 2005 the Navy would need to buy:

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8. Congressional Budget Office, *Future Budget Requirements for the 600-Ship Navy* (September 1985).

9. See Statement of Robert F. Hale, Assistant Director, National Security Division, Congressional Budget Office before the Subcommittee on Projection Forces and Regional Defense, Committee on Armed Services, United States Senate, June 14, 1991, pp. 22-33.

- New ballistic missile submarines to replace the SSBN-726 Trident submarines;
- New attack submarines to replace the SSN-688 Los Angeles class submarines;
- New surface combatants to replace FFG-7 Oliver Hazard Perry class frigates;
- The AX attack aircraft to replace A-6 aircraft;
- The ATS or a similar aircraft to replace EA-6B, E-2C, and S-3 carrier-based support aircraft;
- A short take-off and landing aircraft or other successor to the F/A-18 to replace F/A-18s, F-14s, and AV-8B Harrier jump jets; and
- New antisubmarine aircraft to replace P-3s.

By slowing or postponing these modernization programs, keeping existing weapons longer, or developing less sophisticated weapons systems, the Navy could reduce the funding requirements assumed in the 2005-2010 period.

In addition to examining budgetary savings, the Congress would also have to consider the effects on combat capability of delaying or postponing modernization. Future threats to the security of the United States may well lead the Congress to place a high priority on some or all of these systems. While important, these considerations are outside the scope of this memorandum.